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(54) A metering aerosol valve usable in the upsidedown position

(57) An aerosol metering valve for use in the upsidedown position includes an auxiliary volume (25) adjacent to the metering chamber (16) and serving to retain a volume of liquid when the valve is in the rest state, said volume being available for emptying immediately into the metering chamber as soon as the valve is turned upsidedown for use in the upsidedown position. With the container upright, the ball closes orifice (19) to retain liquid in chamber (25). An alternative embodiment has a piston adapted to isolate an auxiliary volume of liquid.

Fig. 2

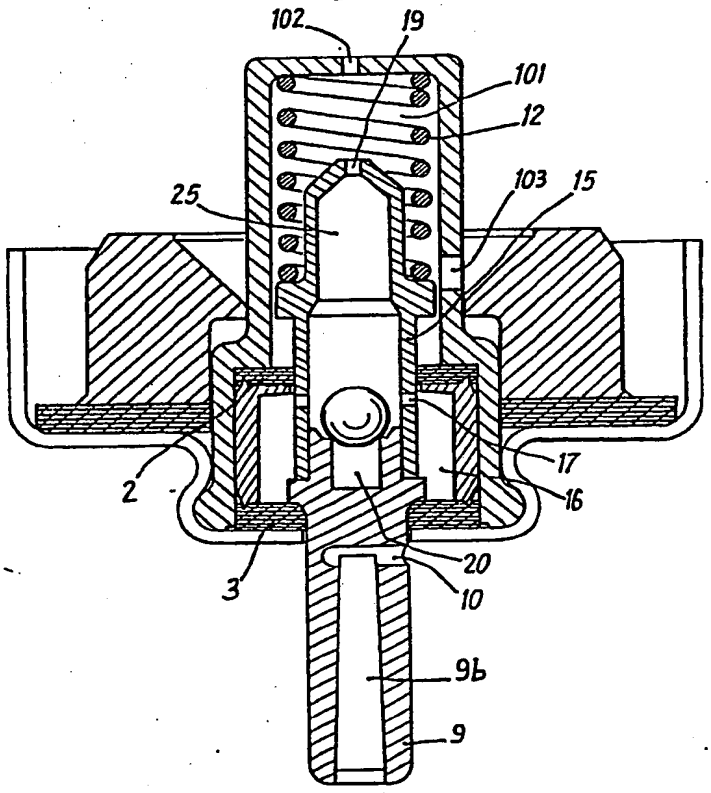

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Fig: 1

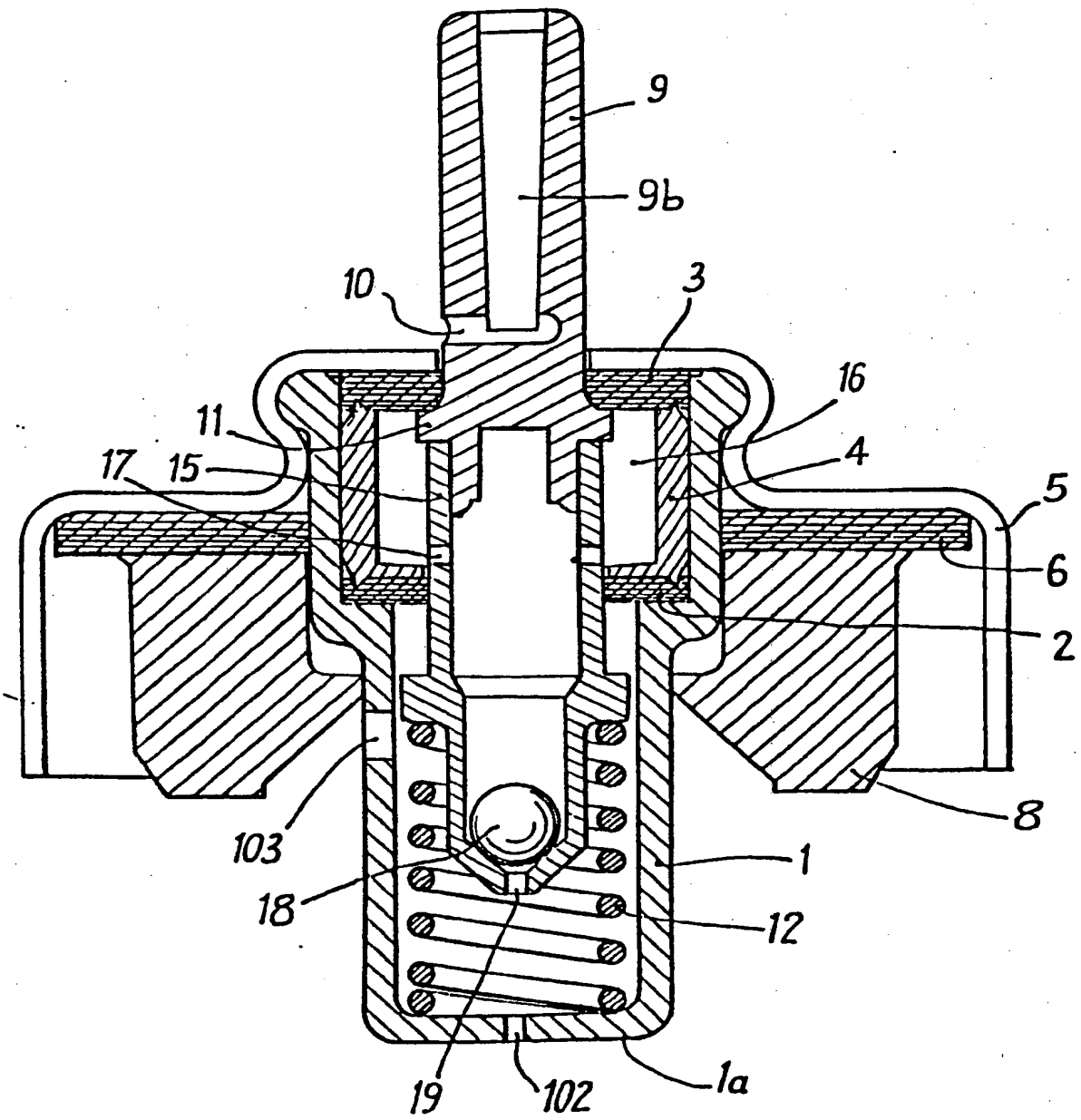

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Fig: 2

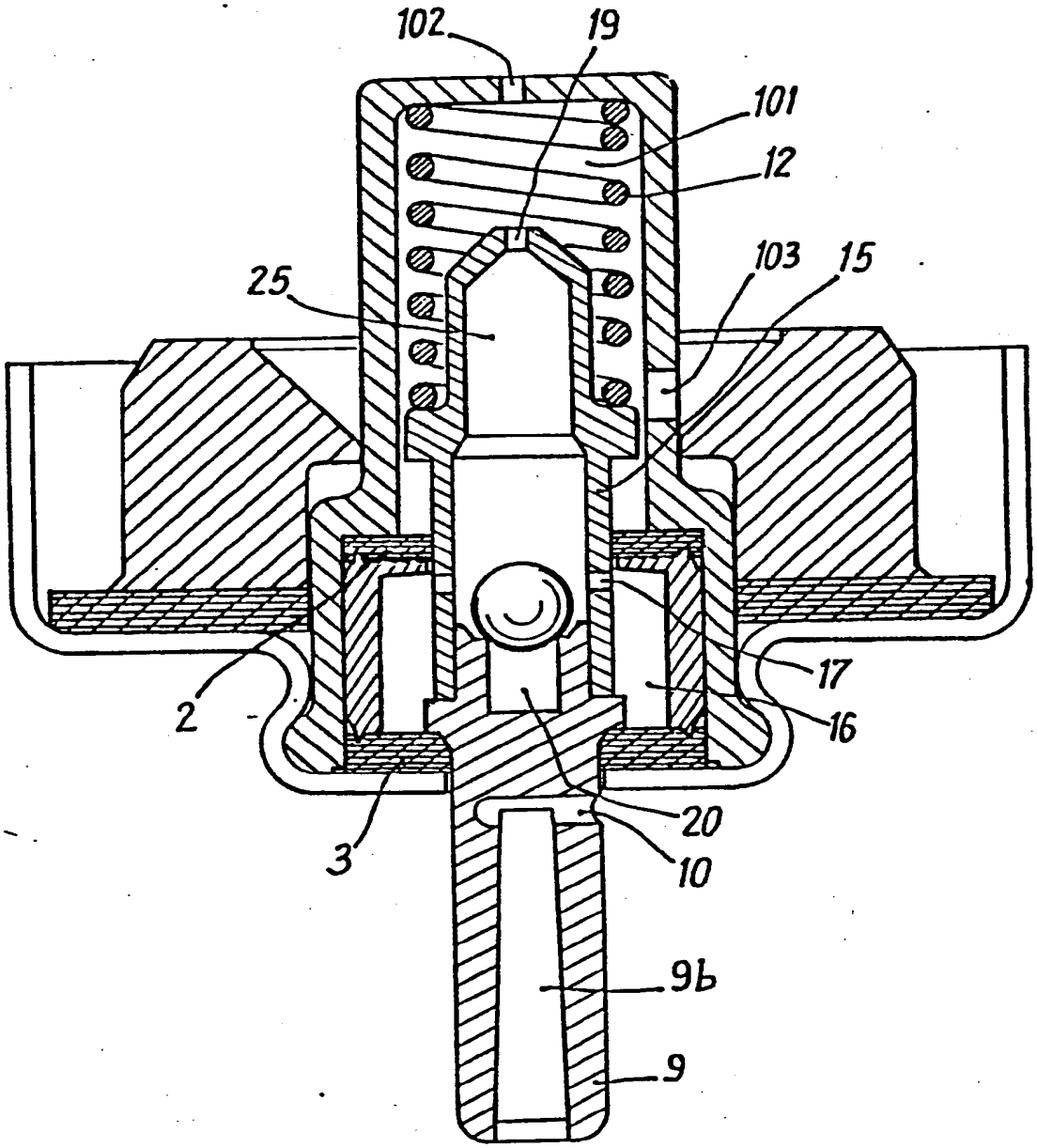

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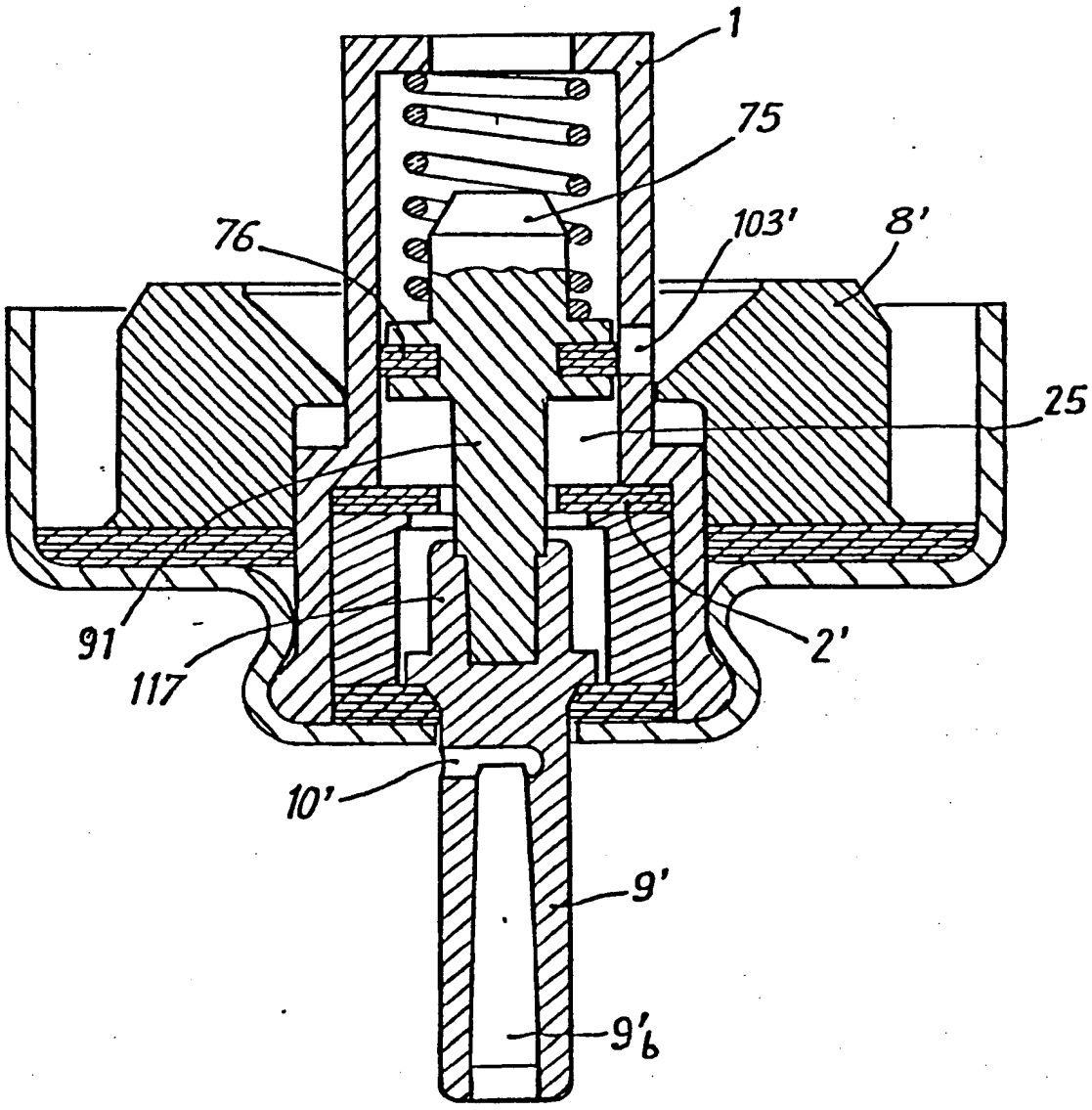
Fig: 3



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A METERING AEROSOL VALVE USABLE IN THE UPSIDEDOWN POSITION

The present invention relates to a valve for a liquid charged with a propellant liquid or liquified gas, the valve being for fitting in the opening of an aerosol can, and usable in the upsidedown position. A valve of this type is described in French patent number 1 225 163, inter alia, and comprises: a valve body open at two ends and containing a metering chamber which is axially delimited by two washer-shaped gaskets, namely a valve gasket and a chamber gasket; and a valve rod passing through the gaskets and movable inside the valve body between a rest state and an actuated state, the valve rod including a shoulder which, in the rest state of the valve, is maintained pressed against the valve gasket by a spring which bears firstly against a shoulder of the valve body and secondly against a shoulder of the valve rod. The outside end of the valve rod includes an axial blind channel which opens out to its outside surface via a radial hole situated at a location such that said hole opens out to the outside of the valve gasket when the valve is in the rest position and to the inside of the chamber when the valve rod is pushed into its actuated position, the outside surface of the valve rod being shaped in such a manner that when in the rest state, the metering chamber is capable of being filled by the liquid contained in the can, and when in the actuated state, communication with the can is interrupted such that the chamber empties via the axial channel of the valve rod under the effect of the propellant gas. When such an aerosol device is not in use, the can is normally stood on its bottom. Naturally, this causes the metering chamber which is then at the top of the can close to its outlet duct to tend to empty, in particular if the metering chamber is of the type which is open in the rest state. When the user next takes the can in the upright position and then turns it upsidedown and actuates the valve at once, there is a danger of an incomplete metered quantity of liquid being expelled assuming that the metering chamber has emptied partially and the can has not been held upsidedown prior to valve actuation for long enough to ensure that the metering chamber is completely

refilled. Further, if after use, the user turns the can the right way up prior to releasing the pushbutton, then the metering chamber will generally fill with gas, and next time the can is used, this too will cause an incomplete metered quantity of liquid to be ejected unless the chamber is given time to refill completely prior to actuating the valve.

The present invention provides a valve of the type specified above, which valve is remarkable in that an auxiliary volume is provided inside the valve body adjacent to the metering chamber and suitable for being filled with liquid by the valve being actuated in the upsidedown position, said auxiliary volume communicating with the metering chamber and being isolated from the inside volume of the can when the valve is in the rest state and the can is the right way up. When the user turns the can upsidedown in order to expel a metered quantity of aerosol from the upsidedown position and in the event that the metering chamber is not already completely full, the volume of liquid contained in the auxiliary volume empties immediately into the metering chamber which is adjacent thereto.

Other characteristics and advantages of the invention appear from reading the following description given by way of non-limiting example and with reference to the accompanying drawings, in which:

Figure 1 is a section through a valve in accordance with the invention shown the right way up and in the rest state;

Figure 2 is a section through the same valve, still in the rest state, but in the upsidedown position; and

Figure 3 is a section through a variant valve in accordance with the invention shown in the rest state and in the upsidedown position.

The valve of Figures 1 and 2 comprises, in conventional manner, a valve body 1 whose top portion (when the right way up as shown in Figure 1) encloses a metering chamber 16 which is axially delimited by two gaskets 2 and 3, comprising a bottom or "chamber" gasket 2 and a top or "valve" gasket 3. The gaskets are held apart by a tubular spacer 4 whose thickness

may be selected in order to accurately adjust the volume of the metering chamber. The gaskets and the spacer are held in place by crimping a capsule 5 onto the valve body, which capsule also enables the assembly to be fixed on a can (not shown) with a neck gasket 6 being interposed therebetween. A ring 8 having a funnel-shaped bottom surface may be provided in order to facilitate complete emptying of the can via appropriate openings provided in the valve body, for example in the form of slots or one or more holes 103.

A valve rod 9 is mounted in the valve body, passing through the gaskets 2 and 3, and is movable between two positions. When in its rest state, the rod is urged outwardly by a spring 12 bearing firstly against the bottom 1a of the valve body and secondly against a shoulder on the rod. The rod is also provided with a shoulder 11 which the spring causes to be pressed against the valve gasket 3. The top portion of the valve rod 9 includes an internal blind channel 9b whose bottom communicates with the outside via a radial passage 10. In the rest state, the passage 10 is located outside the metering chamber above the valve gasket 3, or at very least it does not penetrate into the chamber. When actuated, the hole 10 is fully disengaged beneath the valve gasket 3 inside the metering chamber 16. The portion 15 of the valve rod which extends downwardly (i.e. inwardly) from the shoulder 11 is tubular. The outside diameter of the tubular portion 15 is designed to slide through the central opening of the chamber gasket 2, in a sealed manner. At least one hole 17 is provided through the wall of the tubular portion 15 in the vicinity of the chamber gasket 2 at a location such that said hole 17 opens out into the chamber 16 when the valve is in the rest state but lies outside the chamber when the valve rod is depressed into the actuated position. The bottom end of the tubular portion 15 (when the can is the right way up) has a non-return valve 18 constituted, for example, by a ball resting on a seat, such that the non-return valve is closed when the valve is the right way up and opened when the valve is upsidedown, thereby enabling liquid to reach the hole 17 from the inside of the

tube 15 via the opening 19, and thus penetrate into the chamber 16 (see Figure 2). A recess 20 is provided in the valve rod inside a tubular portion 15 in order to receive the ball when the valve is upsidedown.

The valve operates as follows. The first time the valve is used, the user turns the valve and the can to which it is fixed upsidedown (see Figure 2). The ball opens the opening 19, and the liquid with which the can is filled penetrates into the hollow portion 101 of the valve body in which the spring is received. The gas which was in the valve body can readily escape through the hole 102 formed in the bottom of the valve body, which hole is small enough to restrict the passage of liquid but large enough to allow gas to pass freely. The liquid can then enter the tubular portion 15 of the valve via the hole 19 and then pass through the hole 17 into the metering chamber 16. The user may then push the rod 19 into the can. The hole 17 leaves the metering chamber, and thereafter the hole 10 enters it. The metering chamber then empties through the channel 9b in the well-known conventional manner. Meanwhile, liquid enters the hollow rod via the hole 17 which is then above the chamber gasket 2 (while the assembly is in the upsidedown position). The gas in the hollow rod escapes via the hole 19 and then via the hole 102. After expelling a metered quantity of liquid, the user allows the valve to return to the rest state, and generally stands the can back on its bottom (Figure 1 position). The valve may be released before, during, or after the can is turned the right way up. In any event while the can is being turned the right way up, the ball falls onto its seat and closes the hole 19, and the inside of the tubular portion 15 of the valve remains filled with liquid which cannot escape so long as the can remains the right way up.

As soon as the can is turned upsidedown for a subsequent utilization, the inside volume of the tubular portion 15 is immediately available for being emptied into the metering chamber 16 via the hole 17 supposing there to be gas in said chamber for some reason or other, and this effect is enhanced by the inside size of the tubular portion 15 being close to the

size of the ball 18 over a certain length such that the weight of the ball produces a liquid-thrusting piston effect.

In the variant shown in Figure 3, the fluid penetrates into the metering chamber past the outside of the valve rod 9' which has a reduced-diameter portion 91 where it passes through the chamber gasket 2', with the metering chamber 16 being closed when the valve is actuated by pressing the valve rod by means of a larger diameter portion 117 of the valve rod engaging in the hole through said chamber gasket. In this case, the non-return valve is replaced by a piston 75 and a piston ring 76. When the valve is operated in the upsidedown position shown in Figure 3, the rod 9' is pressed into the can, thereby raising the piston and opening the hole 103', thus sucking in liquid via said hole. When the rod 9' returns to the rest state, the piston closes the hole 103' and expels the liquid into the chamber 16. A non-return valve may be provided inside the piston if the valve is large enough for such a design to be economically feasible, for the purpose of establishing communication between the two sides of the piston in order to allow liquid to pass into the metering chamber.

In both of the cases described and shown above, there exists an auxiliary volume 25 which keeps a reserved quantity of liquid in the immediate proximity of the metering chamber in order to ensure that it is filled at once whenever the valve is turned upsidedown.

CLAIMS

1/ A metering valve for a liquid charged with a propellant liquid or liquified gas and intended to be mounted in the neck opening of an aerosol can which is usable in the upsidedown position, the valve being of the type comprising a valve body open at two ends and containing a metering chamber which is axially delimited by two washer-shaped gaskets, namely a valve gasket and a chamber gasket, and a valve rod passing through the gaskets and movable inside the valve body between a rest state and an actuated state, the valve rod including a shoulder which, in the rest state of the valve, is maintained pressed against the valve gasket by a spring which bears firstly against a shoulder of the valve body and secondly against a shoulder of the valve rod, the outside end of the valve rod including an axial blind channel which opens out to its outside surface via a radial hole situated at a location such that said hole opens out to the outside of the valve gasket when the valve is in the rest state and to the inside of the chamber when the valve rod is pushed into its actuated state, the outside surface of the valve rod being shaped to provide a passage between the metering chamber and the inside of the can when the valve is in the rest state, and to close the chamber when the valve rod is actuated by being pushed into the valve, the valve being characterized in that an auxiliary volume is provided inside the valve body adjacent to the metering chamber and suitable for being filled with liquid by the valve being actuated in the upsidedown position, said auxiliary volume communicating with the metering chamber and being isolated from the inside volume of the can when the valve is in the rest state and the can is the right way up.

2/ A valve according to claim 1, characterized in that the auxiliary volume is provided inside the valve rod which is hollow, said auxiliary volume being closeable by a non-return valve at the end of said rod and communicating with the metering chamber when the valve is in the rest state via a

hole which is moved outside the chamber when the valve rod is actuated by being pushed into the valve body.

3/ A valve according to claim 1, characterized in that the auxiliary volume is delimited by a piston formed at the end of the valve rod, said piston closing a hole through the wall of the valve body when the valve is in the rest state, with communication between the auxiliary volume and the metering chamber being provided by a reduced diameter portion of the valve rod where it passes through the chamber gasket, with the chamber being closed in the actuated state by a larger diameter portion of the valve rod engaging in the opening through the chamber gasket.

4/ A metering valve substantially as herein described with reference to Figures 1 and 2 or Figure 3 of the accompanying drawings.

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